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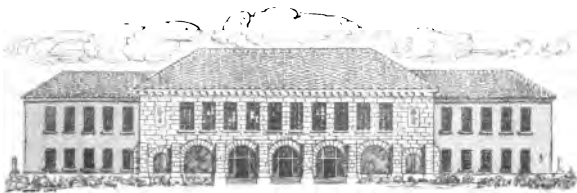


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BUDS STEMS AND ROOTS



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Young Folk's Library of Choice Literature

BUDS, STEMS AND ROOTS.

BY ANNIE CHASE

ILLUSTRATED

DEPARTMENT OF EDUCATION
LELAND STANFORD JUNIOR UNIVERSITY

EDUCATIONAL PUBLISHING COMPANY
BOSTON

NEW YORK CHICAGO SAN FRANCISCO

621376

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1897.

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TO TEACHERS.

This little book does not claim to be exhaustive, but aims at bringing the children into an attitude of appreciation of plant life, its laws of growth and the wonders of its development.

A few seeds or plants brought into the school-room, and allowed to develop there, the children watching each stage of progress, will teach more than hundreds of wonderful buds and stems ruthlessly dissected (?) by little hands already too eager to destroy.

That sort of botany which consists merely of pulling a wonderful blossom to pieces, and wasting its loveliness, that the child may count its petals and see the number written down on a blackboard, is of questionable value.

For studies of seedlings, the old ways of planting in boxes placed in the window, or in sponges or glasses of sand, are all of them good, but a little outdoor garden where the plants can develop naturally, will please the children better, and, in almost every case, will teach them more; especially if the children are taught to tend their plant friends *thoughtfully*.

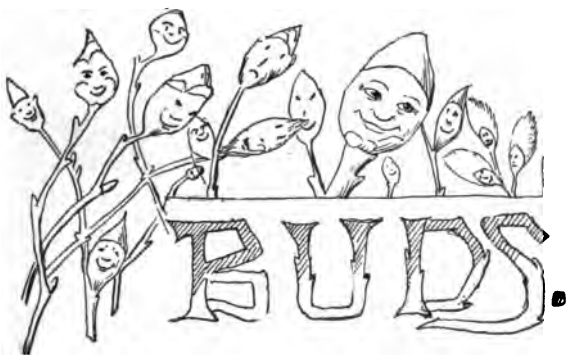
Hoping the following pages will prove of some help to the little people under your care, I remain,

Sincerely yours,

THE AUTHOR.







Here we are!

Big buds, little buds, fat
buds, lean buds, jolly buds,
sober buds.

We are wide awake now,
and ready for business.

Ho! ho! you can not guess
one half we hold in our wise
heads.

Why! our heads are so full
they are bursting!

We must do our work just
right, or there will be no
beautiful, green leaves next
summer, nor any plants,
nor flowers.

But we do not frown nor
fret.

The roots and branches
find food for us, the kind
sun smiles on us, the wind
rocks us, and we do have
such nice times that our
work seems like play.

All last summer the kind branches gathered and stored up food for us.



You see we are covered with little scale-like leaves to keep us warm.

Sometimes these scales are lined with soft fur.

Have you noticed that the horse-chestnut buds are

covered with something which looks like wax?

This is to keep out the wet.

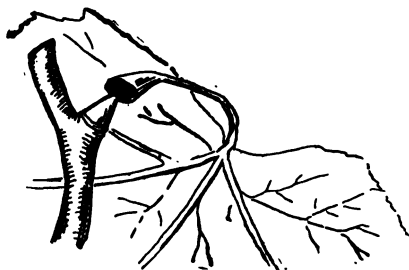
The old tree knows what she is about; she puts it there to keep her baby buds from softening and spoiling.

But some trees and shrubs have such brave little buds that they do not need covering.

There the buds sit close to the bark, and sometimes

hidden under it, and rock away in the cold winds until spring comes.

Some buds have a queer habit of hiding—now, where do you think?



In the hollow stem of the leaf, as you see in the picture.

You would think the tree had not a bud for next year;

but when the leaves drop,
there sit the little buds.

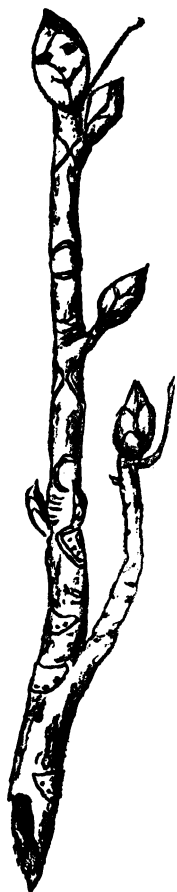
We leaf buds are all toss-
ing off our blankets now.

Beside leaf buds, there are
mixed buds with both
leaves and flowers wrapped
up in them.

You will learn about
flower buds in another book.



A DRAWING LESSON.



THE END BUD SPEAKS.

Do not think I am taking on airs when I say I, the End Bud, or, as wise men call me, the Terminal Bud, am a very wise person.

I make the main stem.

Week after week,

and year after year I work
away at it, and it grows
longer every day.



This is the way I work:
I burst open and hang out
a number of leaves.
Then I form into a bud

again right on the end of the stem.

That makes the branch a little longer.

Next year I burst open again, hang out more leaves, and again form into a bud right on the end.

That makes the branch longer still.

Next year I do the same work.

Here is a branch from a horse-chestnut tree.

Do you see the little scars
on the sides of the stem?

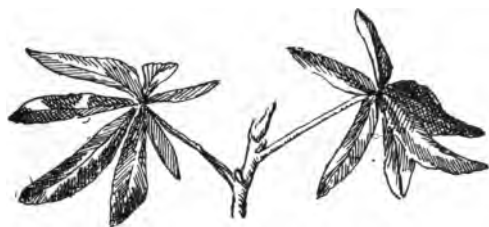


I hung out two
leaves there last
summer.

Then I made the
stem longer, and
hung out more
leaves where you
see the next scar.

Then I formed
into a great bud
again on the end
of the stem, as you
see me in the picture.

Wherever I hung out a leaf I left a bud for next year, cuddled closely down at the end of the leaf stem.



These buds grew some, then kept very quiet while the leaves dropped off and the cold winter winds blew.

You can see these buds in the picture of the long

branch, keeping their seats where the leaves dropped off and left scars.

Each one of these buds will form a branch next summer.

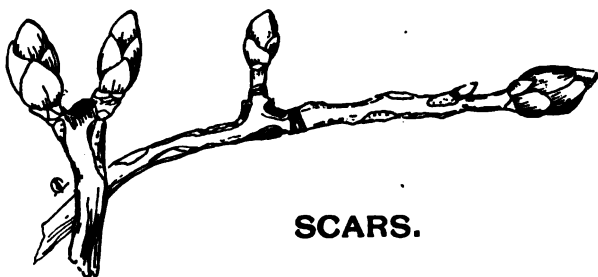
They will hang out leaves as I do, and make their twigs grow longer just as I did.

See, the bud near the lower end of the branch has knitted a long twig already.

By and by he will be a

long, sweeping branch with
lots of children and grand-
children branches of his
own.





SCARS.

Every season the End Bud of the Horse-chestnut had a number of leaves and stems curled up inside his scales.

But at last a spring came when he had something more than folded leaves inside his wise head.

He had a cluster of blossoms hidden there.

They were very small, and were covered with fur to keep out the cold; but there they were; and how proud the bud was of them!

By and by, the leaves hung themselves out in the air, and shook out their plaited folds.

After the leaves were all out, the blossom stood up straight, and began to grow.

By and by, the blossom dropped off and left a round, dark scar.

That scar you can see where the branch is forked.

After the End Bud had done so much work and crowned it with a blossom, he thought he would leave two side buds to work for him.

So he left the buds as you see them on each side of the flower scar.

Next year there were two branches where there had been but one.

The rings around the stems were made by the bud scales.

You see the tree is so fond of her buds, and their leaves and blossoms, that she writes their names all down upon her stems.

You can read them from your twig or from the picture; leaf scars, bud scale scars, and flower scars.

If you have patience enough, you can count the

number of blossoms that longest bough of the horse-chestnut has hung out in the spring air all its life.





A TRUE STORY.

A bud at the end of a twig once began to grow too fast.

The sun was so warm he crept out of his crib altogether too soon.

One night a cruel frost came and pinched and nipped our poor little hero till he was quite dead.

A robin came with his "Cheer up! cheer up! cheer up!" but poor Bud could not be awakened, and all the sun's smiles did no good.

"Oh, dear!" sighed the branch, "I depended upon that big, strong bud so much. Now I shall be dwarfed and crooked."

And April pitied the branch so much she shed some raindrops.

"No, you shall not be hurt;" said a voice.

It came from a tiny bud

which had grown close beside the big bud.

“I am small and weak,” said the tiny bud; “but if you will give me all I want to eat, I will see what I can do for you.”

“I did not have life enough to start before, because the big bud ate up nearly all the sweet juices.”

The branch did her best, the roots did their best, the rain did its best.

And what do you think?

The tiny bud grew so large

and strong that she hung out four leaves through the summer, and made the branch almost as straight as it would have been had the end bud not died.

The end bud fell to the ground, turned into dust, and was finally drawn up through the roots into the tree again.

But it took a long, long time, and he learned not to be impatient.





THE SIDE BUDS SPEAK.

We, Side Buds, are smart, little people, too, though we must say the End Bud has the start of us.

You see us in the picture sitting at the ends of the leaf stems.

When these leaves drop

off, we shall still sit there until next year.

Then we shall each begin to make a branch of our own.

In this twig of basswood, you see we are sitting on the stem, one bud on one side, another bud on the other side, higher up; a third on the same side as the first, higher up, and so on.

The branches will come

out from the buds in the same way. So the new bough will look like this:

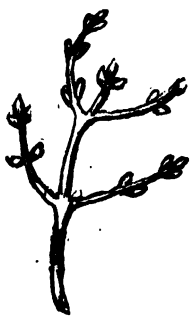


Now look at this picture of a maple twig on the next page, or, if you can find one, look at a twig of real “live” maple.

See, the buds are sitting opposite each other like little twins.



The branches will grow out from these buds. So the new bough will look something like this:



Can you find some twigs in your yard, or in the fields, with buds sitting opposite like these, and buds sitting alternately like those on the basswood?

If you can, you will be able to tell just where the

branches next year are coming out.

Is it not fun to read the trees' fortunes in this way?

Sometimes a bud drops off; then the stem loses a whole new branch.

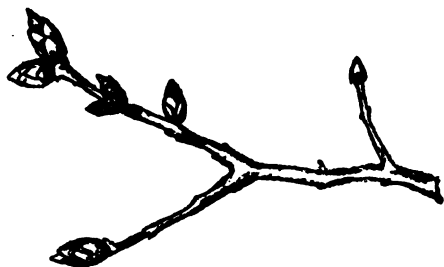
Some trees have more than one side bud at the end of each leaf-stem.

The maple often has three or four such buds in almost every little leaf scar.

And see! this bit of

honeysuckle has a whole crowd of buds at the foot of each leaf.





THE STORY OF A LILAC BUD.

A Lilac tree placed her buds side by side and said:

“Next year I shall have twin branches all up and down these stems.”

But some of her buds fell ill and died, and dropped down to the earth.

“What shall I do?” sobbed the Lilac tree, “what shall I do? Now my branches will not be even; there will be some missing. How shabby I shall look!”

“Oh! now I wouldn’t mind,” said a cherry tree beside; her “we are all in much the same fix, my friend, and we must make the best of it.”

So Lilac did make the best of it, and covered her top

with beautiful, smiling blossoms.

“Oh, what a beautiful Lilac!” said a lady in May; “it is so perfect in form, and so full of blossoms.”

And Lilac felt well paid for looking on the bright side of her troubles.





MAMIE'S DREAM.

Mamie had been learning all about leaf buds on the branches of trees and shrubs. She knew just what work the end buds did.

She knew all about the side buds, and what they could do.

She was going into the garden to plant a few Scarlet Beans and Morning Glories.

The sun shone warm and bright, and Mamie lay down on a large rock to think about the best place for her seeds.

She fell fast asleep, and dreamed such a funny dream that she wanted me to tell you all about it.

One little bean sat up and began to talk.

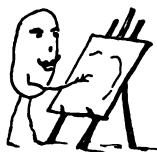
Said he: "Don't forget the buds hidden away in seeds, little girl.



"If you soak my head in warm water, you will be surprised to find how much there is in it.

"It will soon spread open and look like this:"

Here a bean, who seemed to be an artist, stepped up and drew this picture, which



looks exactly like a bean when it is beginning to grow.



“You see there is a bud in my head,” said the bean.

“Oh! oo! there is,” said Mamie.

“All seeds have seed leaves hidden in them,” said the bean; “and as soon as they begin to grow up to the sunshine a bud appears.”

Every tree, and shrub, and plant begins with this first bud," said the bean.

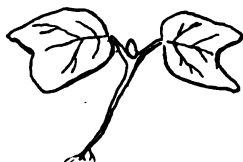
With that he made a bow and tumbled heels-over-head to the ground.

Then Mamie awoke, and, sure enough, there were her beans on the ground beside her.

She planted them, with the Morning Glory seeds, close beside the wall.

When they came up, there

were the buds, just as the bean had told her in her dream.



“Do the flowers and grasses and the great trees all grow from tiny buds hidden in seeds?” said Mamie aloud.

And a Maple tree above
her head waved its boughs
and whispered. "Yes," as
well as it could.



A DRAWING LESSON.



THE MAPLE'S STORY.

First there was a seed, then a bud, then a stem and root, then leaves, then more buds, till there stood a tree, large, and strong, and beautiful.

Let us hear this tree's history.

A little Maple
seed flew away on
its tiny wing.



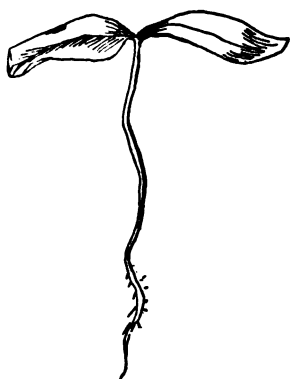
It lay down to rest beside
a grey wall in the meadow,
and fell fast asleep.

When it awoke, a soft rain
was falling, and it stretched
its crumpled, little seed
leaves, then pushed a
stem out of its covering, and
down into the soil.



“Ha, ha!” laughed the
rain in such jolly tones, that

the seed leaves stretched themselves still more, and the stem grew longer.



How did such a baby plant know enough to push its stem into the ground, and its leaves into the sunshine?

“We want more food,” called the leaves from their place in the sunshine.



“You shall have it,” said the stem, digging down into the soil until it became a root.

But one root could not draw up food enough for the growing leaves; so the stem sent out little branches, telling them to work with all their might.

And they did work.

The leaves spread out and grew broader.

Then! Oh joy! A little bud grew right between the two leaves.

How proud the little plant was!

How the stem did
straighten itself and grow!

By and by the baby bud
grew, and one day, when the



sun shone its brightest, the
bud opened into two beauti-
ful leaves.

In time another bud came
between these two leaves.



It grew, like the first, into
two more leaves.

So the little plant kept on

and on, working and rejoicing, working and rejoicing.

Now it is a great tree and can shelter the wild birds, and wave great branches in the wind.

But does it sit idle now, do you think?

No, indeed!

It is working away harder than ever with roots, stems, branches and buds.

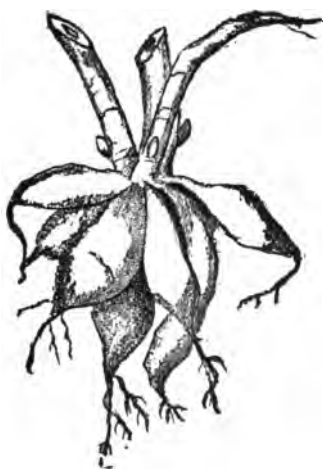
It has hung out a wreath of red flowers this week that it may form some seeds.

Did you notice those little Maples there by the wall?

Those are the children and grandchildren of this very Maple.



Now we must leave our tree climbing up, up, up, and always by a little bud at the end of her stem.



SOME OTHER BUDS.

When your mamma, or papa, or the gardener pulled up the Dahlia bulbs last fall, did you notice some small buds on the stems close down to the roots?

Those buds are all the

plant depends on for next year.

The stout, thick roots are full of nice food for these bud babies.

Now that spring is here, the roots begin to send the juices up to the buds, and the buds begin to swell, and grow red in the face.

We must set the roots in the ground now and give them plenty of water, or the roots will use up all the

food they have, and the baby buds will choke to death.

You see these buds are not like the tree buds.

They do not like to be rocked or covered with snow, or pelted with cold rain while they sleep.

They like much better to be laid away in some warm, dark nook.

The buds of the great red Peony in grandma's garden are just such tender babies.

They hide themselves in

the warm earth for fear of frost bites.

“Oh!” you say, “I thought the roots sprouted.”

No; the roots only nourish the bud at the bottom of the stem till it is pushed up above the ground.

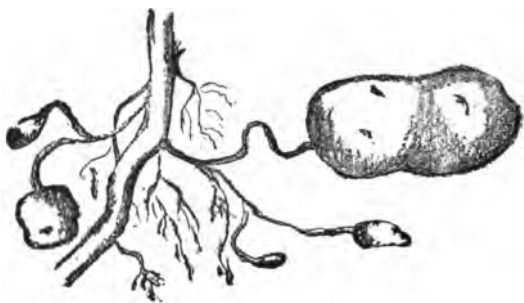
The roots keep on sending up sweet, strengthening food till the bud grows so strong and brave it hangs out great leaves.

When the sun grows quite warm, and the birds are

singing, the bud, grown now into leaves and stems, feels new life and gladness, and she crowns herself with a great blossom.

So you see that plants, and even shrubs and trees, are only buds grown up, and crowned with blossoms and fruits.





SOME UNDERGROUND BUDS.

You thought the potato you had for dinner to-day was the root of the plant you saw swaying in the wind last summer, did you not?

It was not a root; it was a stem, and those little dents, or "eyes," in it were the buds.

"What funny stems and

buds!" you say; "and all under ground."

Yes, the Potato has a queer way of doing her house work.

She stores up food enough for the buds in her underground stems, and lets her leaves and stems above the ground all die off.

Then she lets her roots die too, and there is nothing but the thick, rounded stem, or potato, with its queer buds, or "eyes," as the farmer calls them.



POTATO'S STORY.

“You’ll never grow again,” said an apple to a potato one day in winter.

“You haven’t life enough to open your eyes,” said the saucy apple.

“Ha! ha!” laughed the potato, sleepily.

“You haven’t any roots.”

“No; all dead,” said the potato.

“You haven’t any stems.”

“Haven’t I?” said the potato. “well, I used to be a stem myself.”

“You’re crazy,” said the apple.

Just then a sunbeam came in at a crevice.

Potato rolled over and winked one of his funny eyes, which made the apple laugh so that she softened one of her sides.

“Now, I have seeds,” said the apple as soon as she could speak; “but you have nothing of the kind; your heart is like your head, full of not much of anything but starch and water.”

The potato winked another eye at this and laughed softly.

Just then Tom and Kitty came into the cellar for apples, and the apple rolled away into a corner to hide.

“I am so pretty, too;” said the apple, when the children had gone.

“See my red cheeks and my pretty form.”

But the potato shut both eyes tightly.

“You are an ugly brown thing,” said the apple, but the potato was fast asleep again.

Next day the potato rolled over and looked the apple right in the face.

“Oh! Oh!” squealed the apple, “your eyes look strangely.”

“They are growing,” said the potato in a queer voice

And, sure enough, they were growing, and they kept on growing.

“Nice seedlings, these!” said Farmer Grey, one morning.

“Here is one all sprouted;” and away went our potato, with others, to the field to be planted.

The apple lay still and thought about it.

She thought, and thought, and thought, till she grew old, and faded, and wrinkled. and browner than the potato had ever been.

One day, in summer, she was tossed out into a field, with other things which had been cleared out of the cellar

There, on her right, was her old friend, the potato,

grown tall, and green, and crowned with flowers.

The poor apple hid herself with her seeds in the earth as quickly as she could.

In time she grew to be a tree, but she was never again known to laugh at homely people.



MORE UNDERGROUND BUDS.

Why! this stalk of Solomon's Seal is coming up nearly an inch from the spot where we found it last year.

How can that be?

Let us dig around it a bit and find out.

Here is the stalk, or stem, running along under ground.

At the bottom are the roots, and at the end is the bud.

There the bud has slept through the long winter.

Now it is pushing ahead, and lifting up its tip, to make its way up into the sunshine.

You see that the last year's stalk is nearly an inch behind this new bud.

Look at the scar where the stalk of the year before grew up from just such a bud as the new one.

Back of that is the mark of a bud and stalk of three years ago.

Back of that, the scar of a bud and stalk of four years ago.

These scars look something like seals, and have given the plant its name.

By and by the oldest part of the stalk will die off.

So we have found out your secret, little plant; you travel by pushing your bud ahead under the ground, and then bringing it up into the light to surprise us, as you did to-day.

The Sweet Flag in the meadows, and the Iris by the brook, grow in this way.



SOME BUDS IN THICK JACKETS.

Before those leaves grew up from this Lily Bulb, there was a bud nestled away down in the middle of it.

A precious bud it was, with a lot of leaves and a wonderful blossom folded away in it.

This precious treasure was wrapped in thick jackets, or scales, which the leaves made from their thick ends last summer.



When cold weather came, the tops of the leaves dried up and shook themselves off, but they left the thick part.

The thick parts of the leaves clung around the

bud and looked like scales.

They kept the bud warm,
and gave it food.



BULB OF THE LILY.

By and by the little bud
cried, "Let me out into the
sunshine."

Then every jacket loosened itself a little, and upsprang the bud into light and air.

The onion bud wears a thick jacket, too, and is made up of ever so many thin ones.

Each jacket, or scale, is so long it reaches around the whole bud.

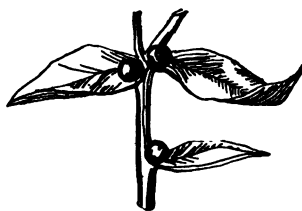


See these crocus buds. The one in the middle is the end bud.

The others, at each side, are side buds.

Did you ever notice those little, black, round balls on the stems of the tiger lily?

Those black balls are buds, covered with such fat scales you would never guess that they were scales.



Those buds drop off, form roots, and grow into plants all by themselves.



SOME OTHER ODD LITTLE BUDS.

Look at that elm upon the hill.

Beside its long, drooping boughs, it has some little twigs growing from the trunk.

They look like a vine running up the trunk.

They are real branches,
and they grow from buds.

These buds sit on the outside of the trunk.

If the tree should be hurt at the top, they would grow into large, strong branches.

Now that the top is all right, they grow just a little, and make a pretty wreath for the tree.

ROOTS.

THE "LITTLE MINERS."



"We roots are miners," says a jolly root, speaking for all the roots.

"We dig, dig, dig, in the moist, warm earth — for what?

"For gold?

"No, no; for the sweet, rich juices the leaves, and stems, and flowers, need.

“We draw in the moisture and food through tiny hairs, which grow all over us, into our little cells.

“From these cells we push the moisture and food up to the stems, and leaves, and flowers of the plant.

“We are covered with a thin coat, or bark, not very much unlike the bark of a tree, or of any stem; except that it is much thinner and softer.

“We know just what to gather to make the beautiful color in the flowers.

“Wherever you see a rose, or violet, or any lovely flower or leaf, just stop and think, little girls and boys, that we roots are at the bottom of all that loveliness.

“If we stopped our work a moment, the beautiful rose would die.

“Did you ever know a root foolish enough to push

itself up, feet foremost, into the sunshine where it did not belong?

“No, you never did and never will.”

Who taught all the millions and billions of roots so much wisdom?



A DRAWING LESSON.



ROOT CAPS.

You will laugh, I know,
when you are told that
roots wear caps.

And where do they wear
their caps?

On the tips of their toes;
that is, down on the very
ends of them.

If you plant a bean in a
sponge, so that you can see
the tip of the root, you can
find the cap if you will
look closely.

The funny little cap is made of hard skin, or tissue.

The cap is to shield the little root as it digs down into the soil.

The root grows just back of the cap, and pushes it along like a tiny snow-plough through the hard soil.

If the wise little root did not wear a cap on its toes, it could never make its way down to where the food is stored in the earth.



A FABLE.

A Wild Rose grew by the
pasture wall;

A beautiful shrub, with
branches tall,

With wonderful colors,
and rich perfume.

A daisy looked up at her
rosy bloom.

“Of which are you proudest,
Rose, so fair,
Of your stems, or leaves, or
your flowers rare?”

“Of neither,” said Rose,
with a graceful bend,
“I am proudest of my roots,
sweet friend.”

“Of your roots? Those ugly
things down in the
earth?”

Here all the daisies bent
with mirth,
And a bobolink, swinging
on a twig,

Sang and danced his liveliest jig.

“Of my roots,” said the
“Rose; for they work
away

Down there in the darkness,
day after day,
Contented if only the
flowers blow

Up here in the sun, while
they toil below.”





SOME ROOTS WHO WERE MISERS.

These roots were real misers.

They kept digging and digging, and eating and eating good things, all last summer.

These good things they

kept swallowing, until they were so fat they looked like little balls.



They sent out branch roots and kept on eating.

Turnip, beet and parsnip roots are some of the misers.

But they had a reason for being so greedy.

They had to store up food enough to feed the buds at their tops when they began a new life this year.

Plants which live two years, and do not blossom until the second year, have this kind of root.

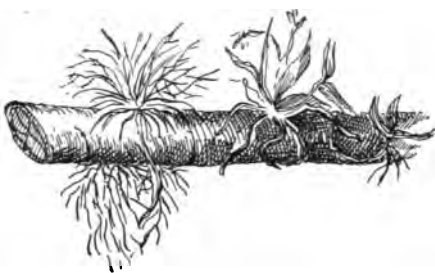
Can you think of some roots in your garden which were misers, too?

Plants which live only one year do not need these fat roots.

They have tiny, branching roots like these:



Trees and plants, which live on year after year, have these branching roots, too, but much larger and stronger.



SOME ODD ROOTS.

We have learned that no plant ever pushes its leaves down under ground and sends its roots up in the air; but there are some roots which never touch the ground.

Look at a piece of English ivy in mamma's window.

There are little roots on the sides of the stem.

These are to help the ivy climb, and they will cling to the wall if you let them.

Poison ivy climbs in this way.

So does the Trumpet creeper.

But these ivys and creepers have real roots, too.

There are some plants that cling to the barks of trees, and hang their leaves, blossoms, and roots, all out in the air.

Orchids grow in this way.

Some plants, like the Mistletoe, strike their roots through the bark of the tree and feed upon the tree's own juices.

Little thieves, are they not?

But away out in India is a tree with strange roots.

When the tree is well grown, a strange thing happens.

The branches send out roots.

These roots dangle in the

air until they . are long enough to touch the ground.

Then they strike into it and grow until they look like trunks.

One tree will spread in this way over a great space, and look like a whole grove.



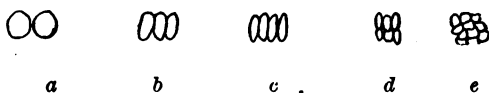
This strange tree is called the Banyan tree.



THE PLANT'S KNITTING WORK.

All plants grow by cells.

The cells in the baby plant begin with being round like these marked (a).



A third little cell grows and presses against the others, making them flatten like those marked (b).

You see at (c) another little cell has come up, and they are all flattened still more.

The plant knows just how and where to push the cells to make roots, stems, buds, flowers, and fruits.

The plant knits away patiently, day after day, making one tiny cell after another.

Some of these cells harden and make the wood of woody stems.

Some are always softer,
making up the leaves, flowers,
and fruits.

The roots, too, are only
little cells held together.

The cells of the roots take
in minerals.

Would you believe it?

They eat iron, potash, and
even sulphur.

This food they send along
to the stems, leaves, and
blossoms.

But the little cells cannot

eat these things just as they are found in the earth.

So the sweet rain comes down, soaks into the soil, and makes a syrup for the little plants by soaking these minerals.

The root cells, the stem cells, the leaf cells, the flower cells,—all drink this queer syrup.

Then the cells grow larger, new cells come, and the whole plant is a little larger than it was before the rain.

After the plant cells have eaten all the minerals they can hold, where do you think the water that is left goes to?

The leaves throw it, off just as your lungs throw off the air, and the sun drinks it up before you can see it.

The leaves draw in food, too, as your lungs draw in the air.

So your plants must have earth, air, water and sun, or they will die.



THE STORY OF A CELL.

A little cell, away down
in the heart of an oak, grew
very tired of being crowded.

He grumbled a great deal.

Said he: "I am sick of
working, working here in
the dark, day in and day
out.

"I am tired of being
crowded till I am flat and
helpless. I will give up."

So the little cell died.

“I will die, too,” said another cell; “nobody will notice any change in this great oak because of me, and I, too, am tired.”

So this cell died also.

Next day another died; he could not get food because the two cells near him had died.

Next day three or four more cells died.

Next day many died.

By and by the noble oak stood with a great hollow in his side.

“Ah me!” said the oak, “I now fear the rude winds that I once laughed at, until one little cell did not do her work.”

The next day a great storm came.

The oak trembled and fell with a crash.

He lay with all his beautiful leaves and branches on the ground.

The wind sighed, and the rain wept sad tears.

“Rotten at the heart,” said a maple near by, “rotten at the heart; work away my own little cells, and learn a lesson from this fallen king.”





STEMS.

“All that is well enough,
and quite true; but do tell
the children about stems,”
says a voice.

The voice comes from a
brownie, perched on a bough
of a tree right over my head.

Quite true, little brownie;
buds and roots could never

do their work without the stems.

The stems are the pipes, or tubes, which carry the sweet juices from the root up to the leaves, buds, flowers, and fruits.

But, as you can see for yourself, all plants do not have stems alike.

See that tall horse-chestnut tree.

Its great, hard trunk, covered with bark, is its stem.

Now look at the bright dandelion on the bank beside it.

The dandelion's stem is soft, and tender, and hollow, as you found when you made the dandelion chain yesterday.

If a plant is going to live year after year as the tree does, the wise little cells pack themselves closer and closer, till they make a hard surface.

Some of them change into tubes or fibres.

You can see these tubes plainly in a corn stalk.

These tubes make the tougher part of the stem.

Soft stems, which will live but one year, like the dandelion's stem, do not have these tough, woody cells.

They have soft, little cells, instead, all the way up the stem.

That is why you can

break the dandelion's stem so easily.

How the dandelion would look with a great woody, clumsy stem like the tree's stem!

And how could the tree hold up all those leaves and branches with a soft, tender stem like the dandelion's?

Who taught them just how to form their stems?

See, they are both growing from the same soil.

As the whole plant grows larger, so stems grow larger, by making more cells.

Look at the tree in the yard.

Its stem, or trunk, is very large at the bottom.

See how it dwindles away towards the top.

What makes it smaller at the top when, inside its bark, it is all the time making new cells?

It is this way:

When the trunk threw

out its first branch, it sent part of its cells and woody tubes into it.

When the trunk sent out another branch, it gave away some more cells and fibres.

When it sent out another, it gave away more, and grew still smaller.

How a tree would look with the top of its trunk as large as its base!

How Mr. Wind would beat upon it!



THE STORY OF A STICK OF WOOD.

A few years ago this pine stick was a slender twig covered with a skin which had no color.

Under the skin was a layer of green bark.

Next the green bark was the woody part, made up of hardened cells; inside this woody part was the soft, spongy part, called the pith.

In a year, the twig had turned its skin into a brown bark.

The wood was thicker, and the pith drier.

The twig holds sap between the bark and the wood.

Every year this sap made more bark on the outside, and more wood on the inside.

Every year a new ring of wood was made.

You can see the rings in the sawed end of the stick.

Almost all herbs have stems like the young twig.

Almost all trees form their trunks and branches just as this twig was changed from a tender shoot to a hard stick.

The older, darker wood in the stick is the heart wood.

The new, lighter wood is the sap wood.

That knot in the wood has circles of its own.

It was once a branch, and either died or was cut off.

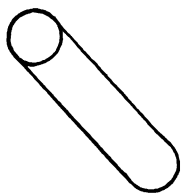
Every year the stem made a new ring until the dead branch was buried deep in the wood.

If you count the rings outside the knot, you can tell just how many summers have gone by since the branch which made the knot died.

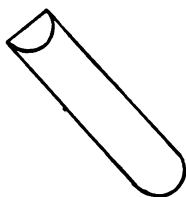
SHAPES OF STEMS.

You know that all stems are not shaped alike.

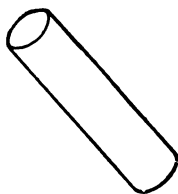
Can you find some stems shaped like these?



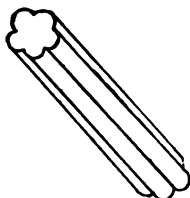
ROUND.



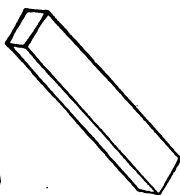
FLATTENED.



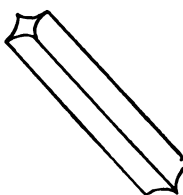
HALF-ROUND.



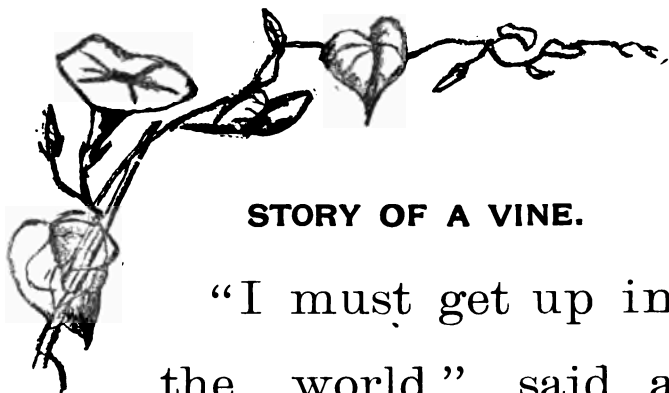
FLUTED.



SQUARE-ANGLED.



FOUR-SIDED.



STORY OF A VINE.

“I must get up in the world,” said a Morning Glory.

So she reached up and twined her stem around a rude post.

“Dear me!” said the post, “I am so clumsy and stupid I fear I shall not help you much; besides, I am very short.

“When you have reached my top, where will you go?”

“Don’t know,” said Morning Glory, working away with all her might to get ahead of a scarlet bean near by.

The bean worked, too, until it got so red in the face that it made old Dick, the gobbler, angry.

Said the bean, “Now I have a post set on purpose for me.”

“Never mind,” said Morning Glory, “I must do my best just where I am.”

And she did.

She soon reached the top of the post.

“How sweet the air is away up here! I wish I could climb higher.”

There was nothing for her to cling to, but she reached her stem up as high in the air as she could.

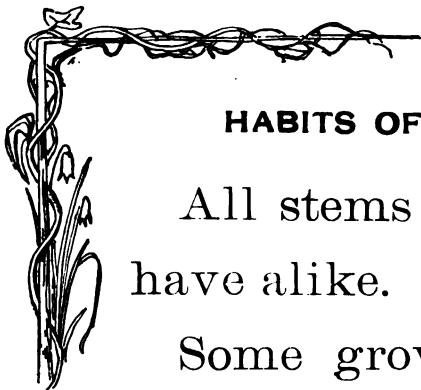
The sun smiled at her and

the wind whispered something in Mamie's ear, I think.

At any rate, Mamie looked up at the vine and said:

“Oh, papa! Morning Glory wants to climb higher. See, she is looking about now for a cloud to climb to.”

So papa brought a ladder and a string; and now Morning Glory has climbed almost as high as a young elm tree in the yard.



HABITS OF STEMS.

All stems do not behave alike.

Some grow straight up.

Some seem too weak to hold themselves up.

These trail along on the ground.

Did you see any trailing stems on your way to school?

Some are too weak to grow straight up; still they are bound to climb.

These twine themselves around some strong stem or post by curling their own stems.



Some of these creepers, or climbers, like the Sweet Pea, throw out little tendril-like arms to climb by.

The Virginia Creeper makes little pad-like

hands on the ends of its arms.



These pads cling to a wall or tree and hold the vine in place.

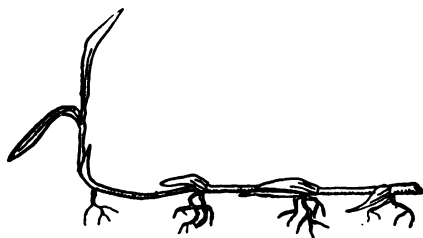
Mamma's English ivy climbs by little roots on the sides of the stems.

Some stems grow underground, as the potato did,

and as did the root-stalk of the Solomon's Seal that we read about.

The quick-grass has an underground stem.

You can tell the stem from a root by the leaves, or scales, it wears at every joint.

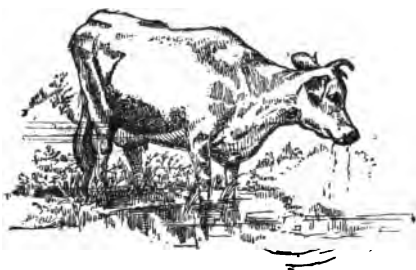


Some underground stems, like the lily, are very fat and covered with scales.

A few plants, like the palm, the corn, and some lilies, have just one simple stem.



But almost all stems have branches.



WHAT THE QUICK-GRASS DID.

Farmer Gruff was angry.

Old Brindle had slipped away from him and gone to the orchard, where the grass was tall and sweet.

“Hi, hi!” called the farmer.

Brindle ran, but was soon caught, and, I am sorry to say, was kicked and pounded.

Great tears stood in her meek brown eyes when she was at last in the pasture.

“Never mind,” said a root of Quick-Grass; “I’ll pay him for his cruelty.”

Then she and her cousins, and aunts and uncles, and children and grandchildren, fell to work.

They sent stems along underground, away into Farmer Gruff’s potato patch.

Down under the ground they choked and strangled every one of the potatoes.

Then they pushed up

their saucy blades, and covered the ground all over with green, where it should have been soft, black soil.

“Ho, hum!” grumbled the farmer, as he hoed, and hoed, and hoed, to get out the saucy witch-grass.

“Ho, hum! I have bad luck.”

In spite of all his care, there were no potatoes that year; and next year Brindle was put in that very field.

“For,” said the Farmer, “it is of no use to plant a crop in that spot; it is all grown over with ‘witch-grass.’”

“I can reach the other field, too,” said the Quick-Grass saucily; and Brindle shook her head, and ate a bunch of clover, which the grass had allowed to grow for her.

“I am poor food for you;” said the Quick-Grass to

Brindle, but you are welcome to me such as I am."

"Thank you!" said Brindle; "you are much sweeter than the grey moss and the huckleberry bushes in my old pasture; but the farmer still kicks me."

"Then I will run all over everything," snapped the Quick-Grass, with an angry flash of her blades.

And away she ran as fast as her root-stalks could carry her.



KINDS OF BRANCHES.

See those runners the strawberry plants have thrown out.

They look like little threads.

They are branches.

New roots grow on the end of the runner or branch and reach into the soil.

Then leaves grow upon it, and there is a new plant.

This new plant sends out

a runner and makes another new plant.

The stems of leaves and flowers are branches.

Did you see that little apple tree in the orchard?

It grew from its mamma tree near by.

The root of the large tree sent up a shoot, or sucker, as Farmer John calls it.

This sucker is one kind of branch and makes a new tree.

Bulbs and tubers are stems, as you have learned.

Those thorns on the pretty rose bush are another kind of branch or stem.

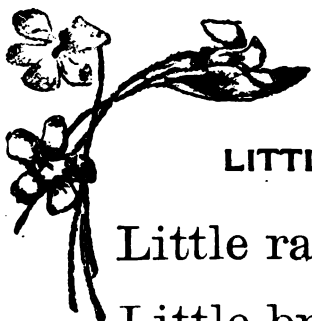
Now what have you learned from all this?

“Oh!” says Nell, “all about buds and what there is in them, about stems and what they do, and how they do it, and about roots and what they can do.”

Yes, and you have learned,

too, that roots, stems, buds,
leaves, flowers, sun, rain,
air and earth must all work,
or we should not have a
single plant to cheer us.





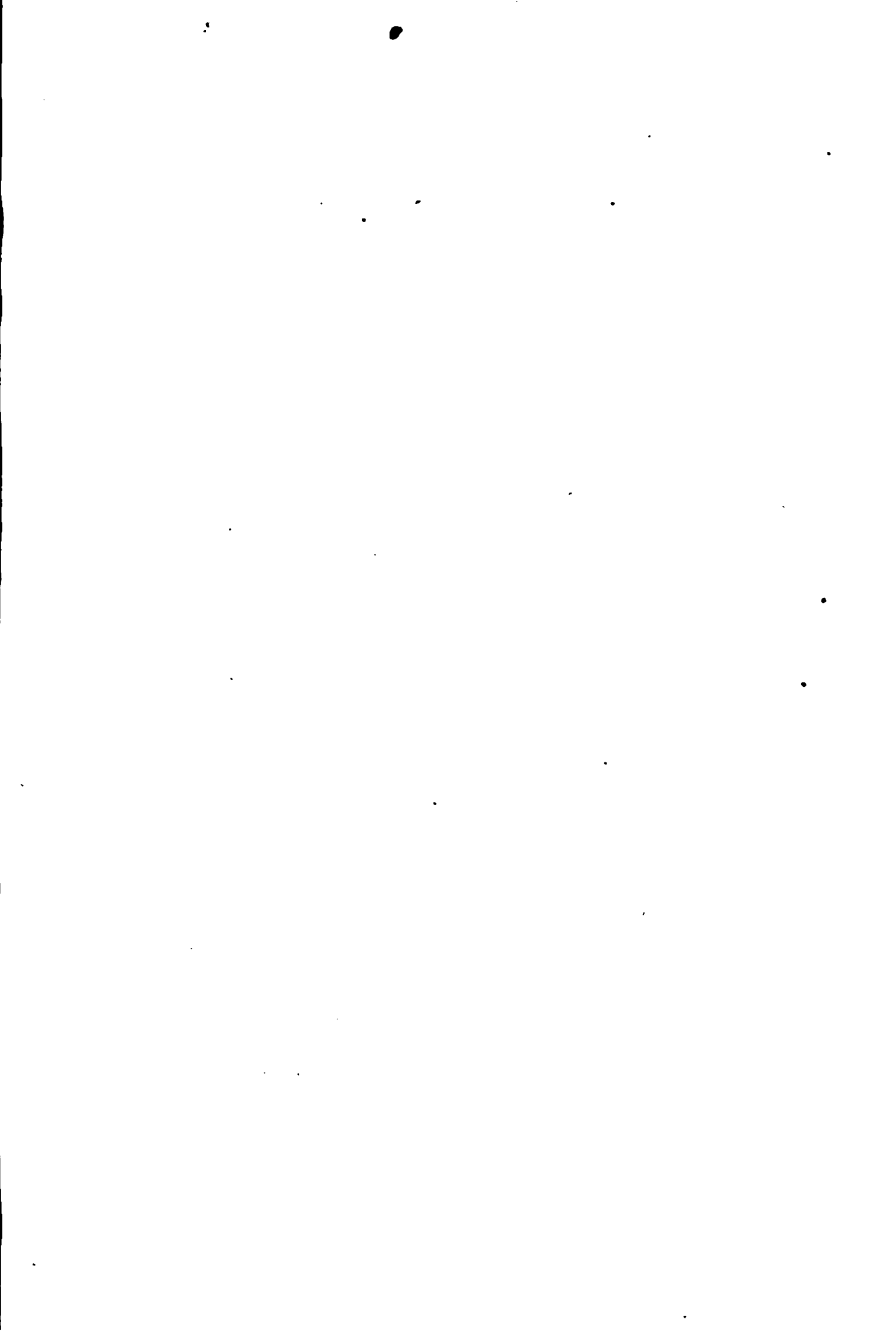
LITTLE WORKERS.

Little raindrops patter,
Little breezes blow,
Little sunbeams smile their
best.

Look! down there below.

There's a rose, a lily,
A violet, harebell;
All because we little things
Did our work so well.





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